FIG.1
Background Art

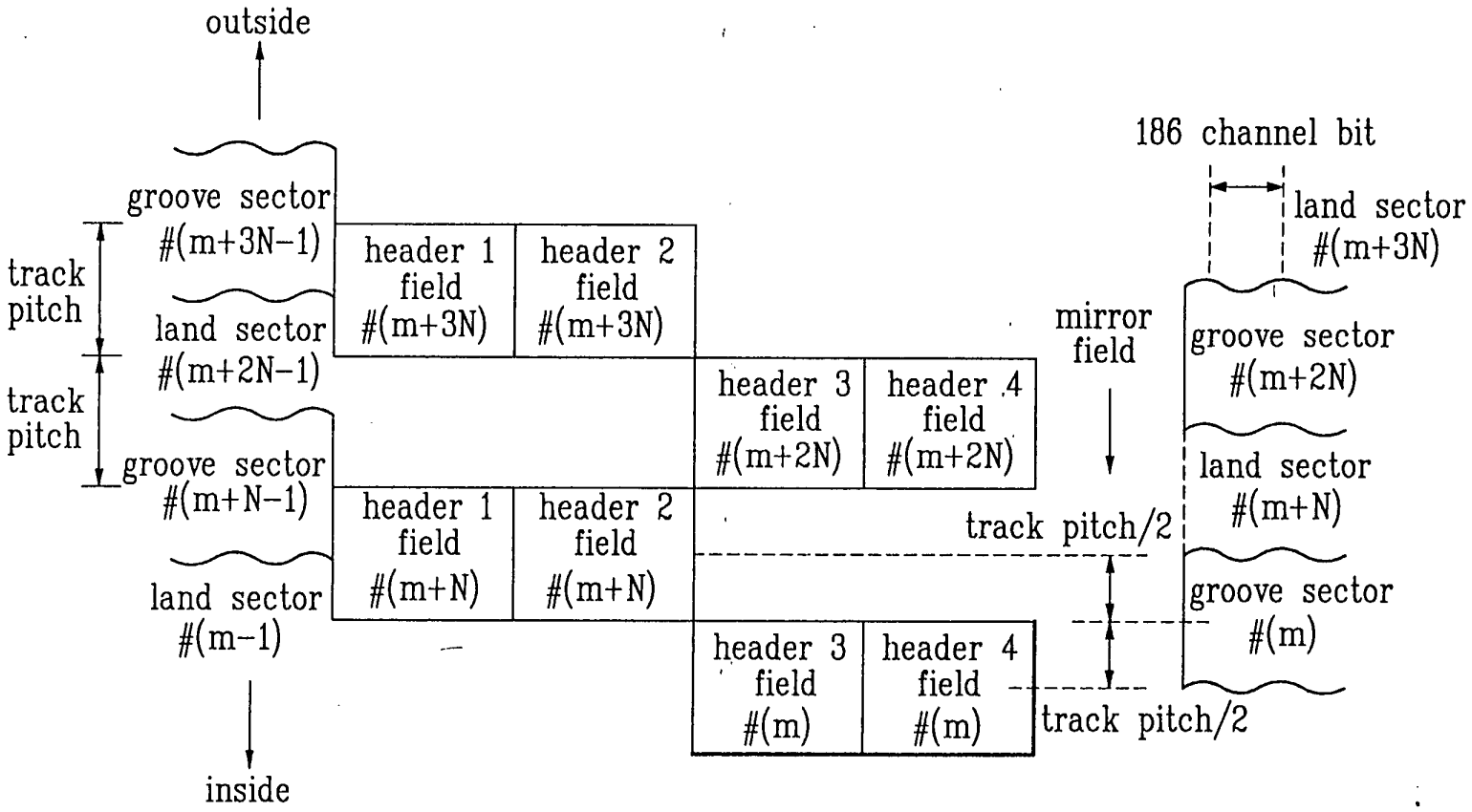


FIG.2

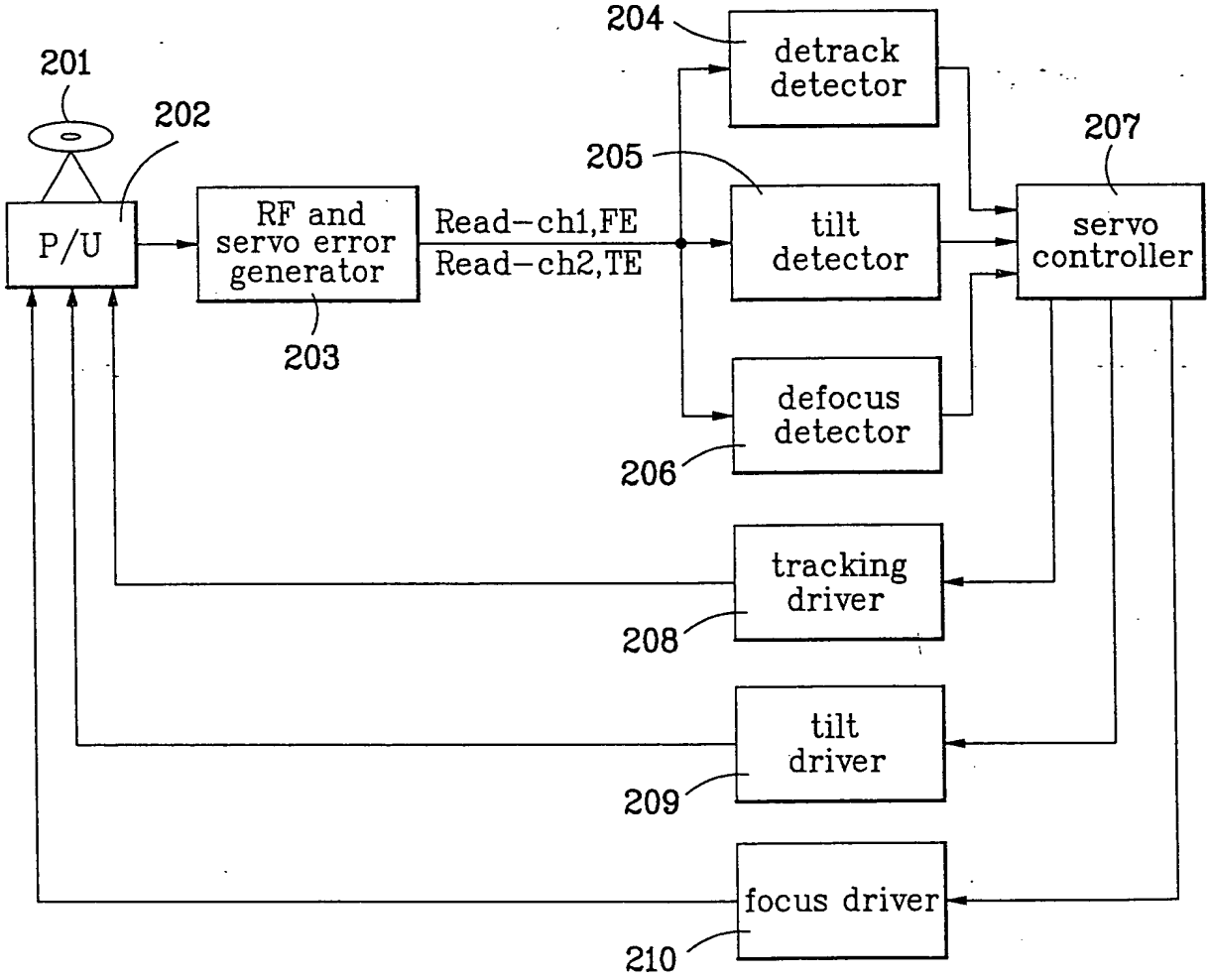

201
202
P/U
RF and servo error generator
203
Read-ch1,FE
Read-ch2,TE
204
detrack detector
205
tilt detector
206
defocus detector
207
servo controller
208
tracking driver
209
tilt driver
210
focus driver

FIG.3

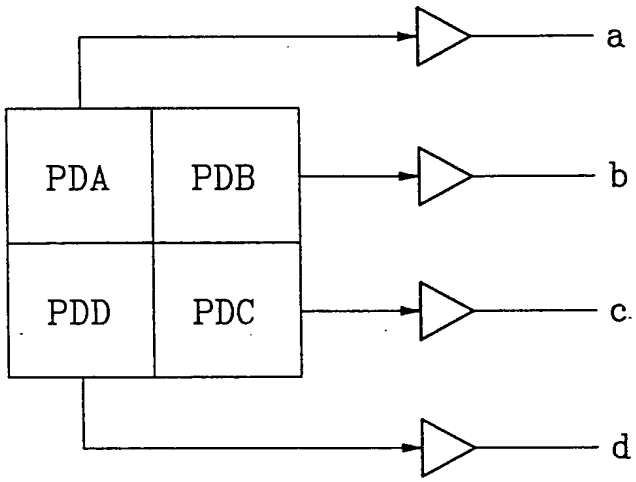

a
PDA
PDB
b
PDD
PDC
c
d

FIG.4

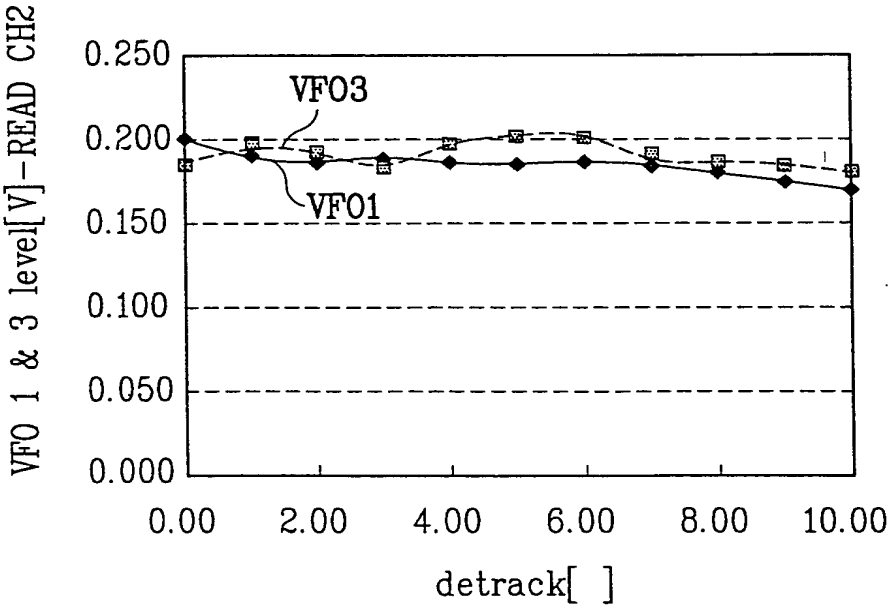
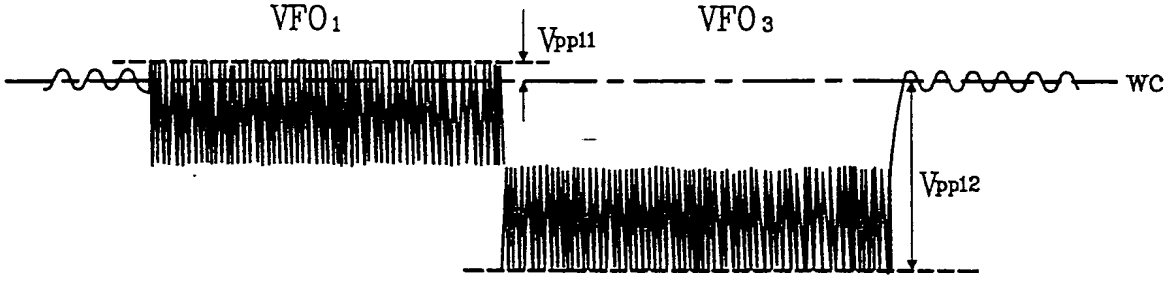
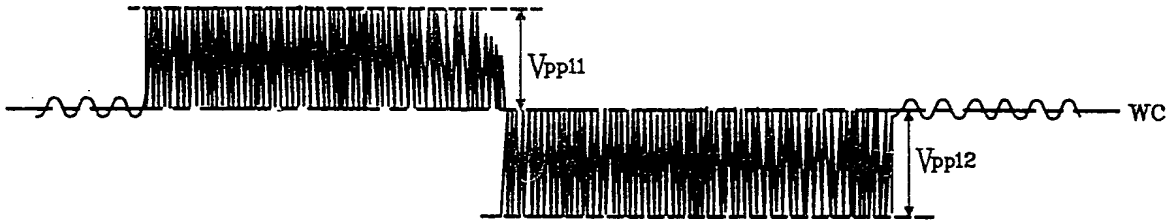

VFO 1 & 3 level[V]-READ CH2
0.250
0.200
0.150
0.100
0.050
0.000
VFO3
VFO1
0.00
2.00
4.00
6.00
8.00
10.00
detrack[ ]

FIG.5A



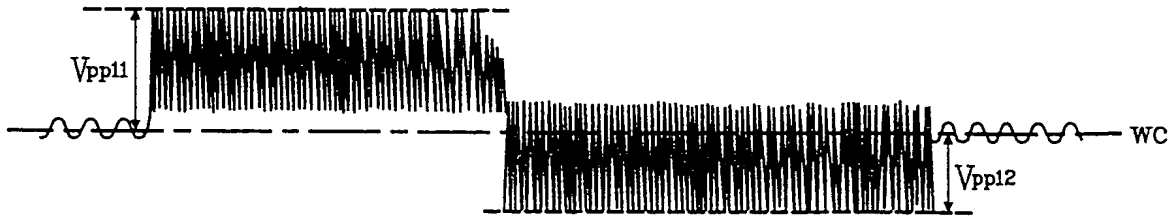
tilt=0, detrack offset=0
defocus offset=4.08

FIG.5B



tilt=0, detrack offset=4.97
defocus offset=4.08

FIG.5C



tilt=0, detrack offset=10
defocus offset=4.08

FIG.6

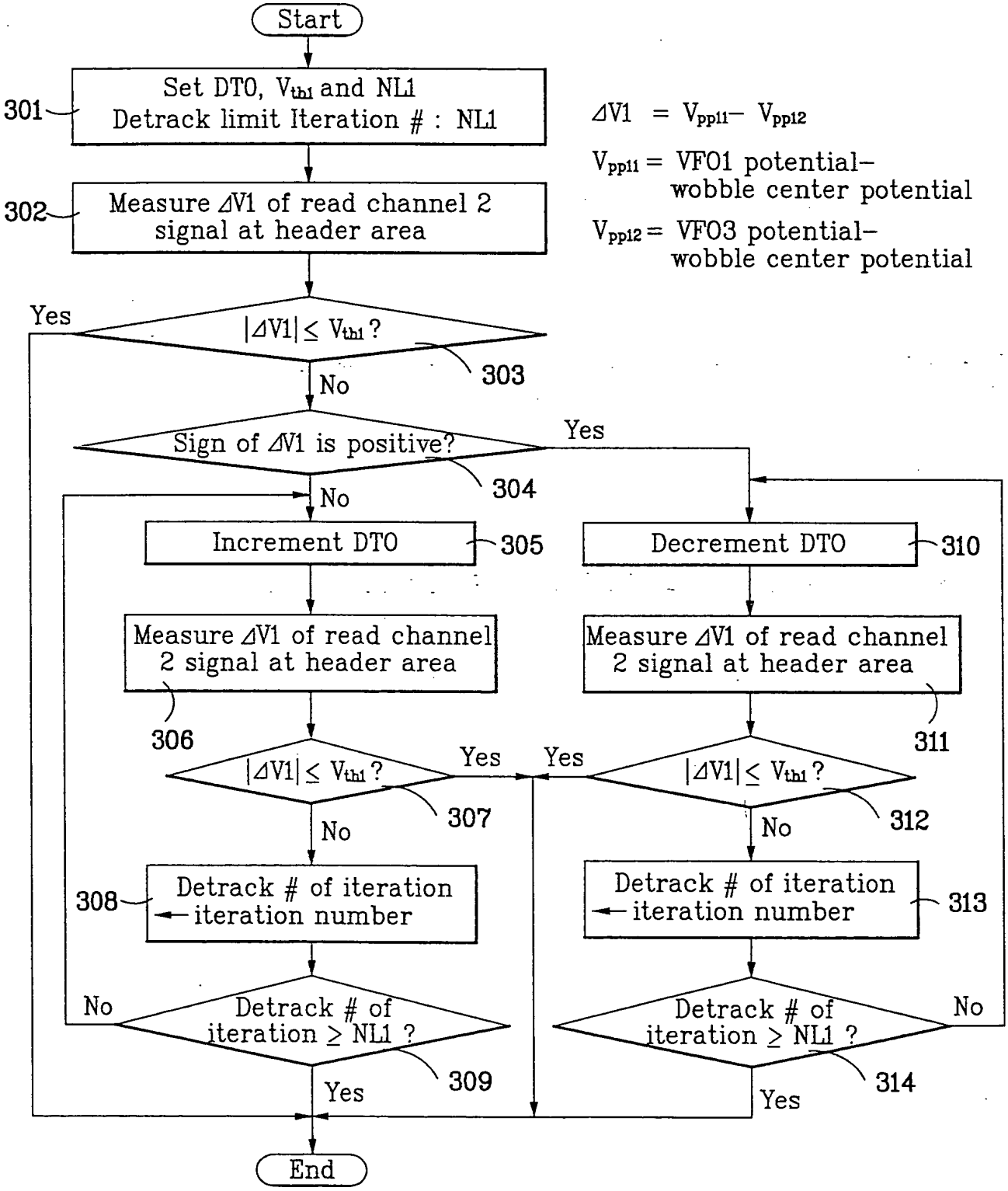

Start
Set DT0, V_{th1} and NL1
Detrack limit Iteration # : NL1
301
Measure ⊿V1 of read channel 2 signal at header area
302
$|\Delta V1| \leq V_{th1}$?
303
Yes
No
Sign of ⊿V1 is positive?
304
Yes
No
Increment DT0
305
Measure ⊿V1 of read channel 2 signal at header area
306
$|\Delta V1| \leq V_{th1}$?
307
Yes
No
Detrack # of iteration ← iteration number
308
Detrack # of iteration ≥ NL1 ?
309
No
Yes
Decrement DT0
310
Measure ⊿V1 of read channel 2 signal at header area
311
$|\Delta V1| \leq V_{th1}$?
312
Yes
No
Detrack # of iteration ← iteration number
313
Detrack # of iteration ≥ NL1 ?
314
No
Yes
End
⊿V1 = V_{pp11} − V_{pp12}
V_{pp11} = VFO1 potential − wobble center potential
V_{pp12} = VFO3 potential − wobble center potential

FIG. 7

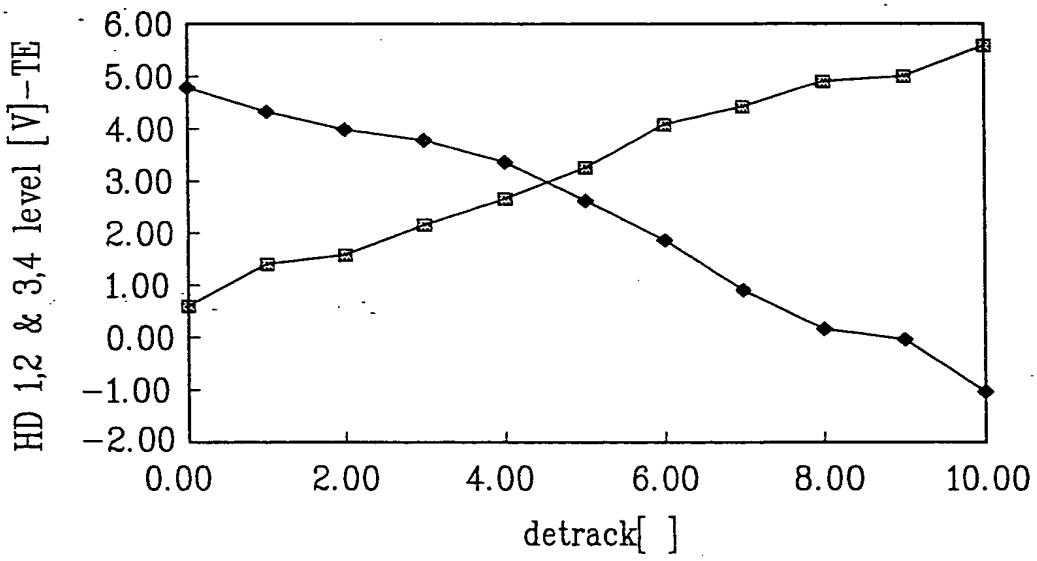
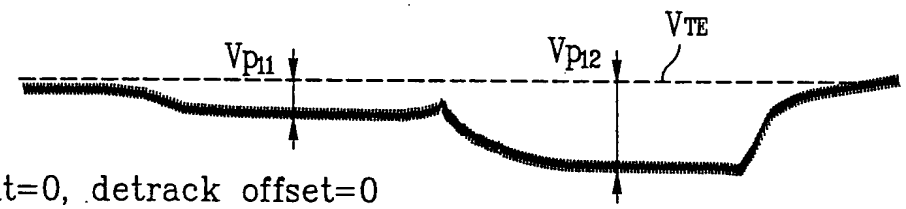
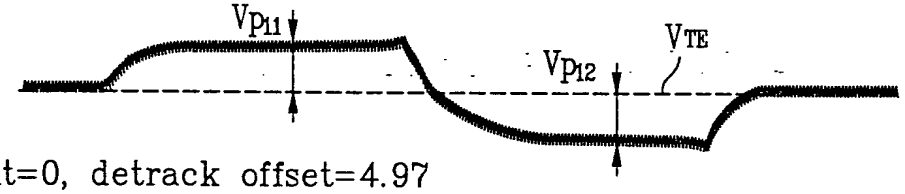

HD 1,2 & 3,4 level [V]-TE
6.00
5.00
4.00
3.00
2.00
1.00
0.00
−1.00
−2.00
0.00
2.00
4.00
6.00
8.00
10.00
detrack[ ]

FIG.8A



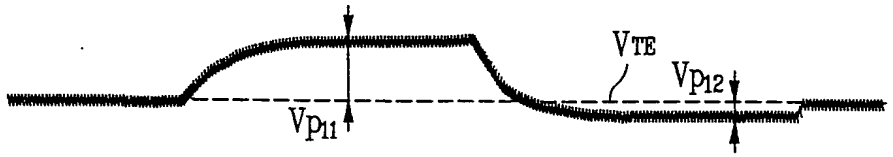
tilt=0, detrack offset=0
defocus offset=4.08

FIG.8B



tilt=0, detrack offset=4.97
defocus offset=4.08

FIG.8C



tilt=0, detrack offset=10
defocus offset=4.08

FIG. 9

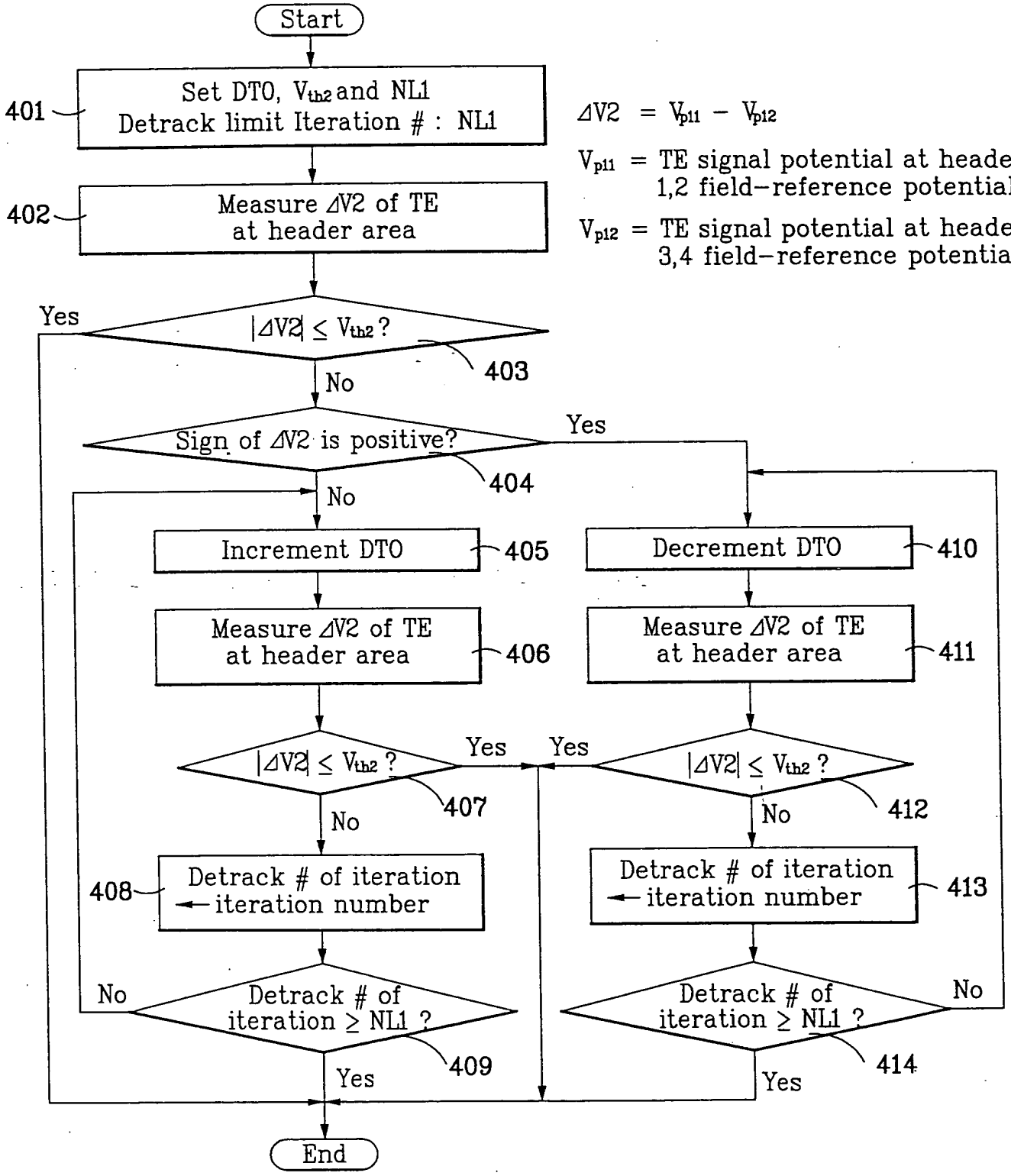

Start
401
Set DTO, V_{th2} and NL1
Detrack limit Iteration # : NL1
402
Measure ΔV2 of TE
at header area
Yes
$|\Delta V2| \leq V_{th2}$?
403
No
Sign of ΔV2 is positive?
404
Yes
No
Increment DTO
405
Measure ΔV2 of TE
at header area
406
$|\Delta V2| \leq V_{th2}$?
407
Yes
No
408
Detrack # of iteration
← iteration number
Detrack # of
iteration ≥ NL1 ?
409
No
Yes
Decrement DTO
410
Measure ΔV2 of TE
at header area
411
$|\Delta V2| \leq V_{th2}$?
412
Yes
No
Detrack # of iteration
← iteration number
413
Detrack # of
iteration ≥ NL1 ?
414
No
Yes
End
$\Delta V2 = V_{p11} - V_{p12}$
V_{p11} = TE signal potential at header 1,2 field-reference potential
V_{p12} = TE signal potential at header 3,4 field-reference potential

FIG.10

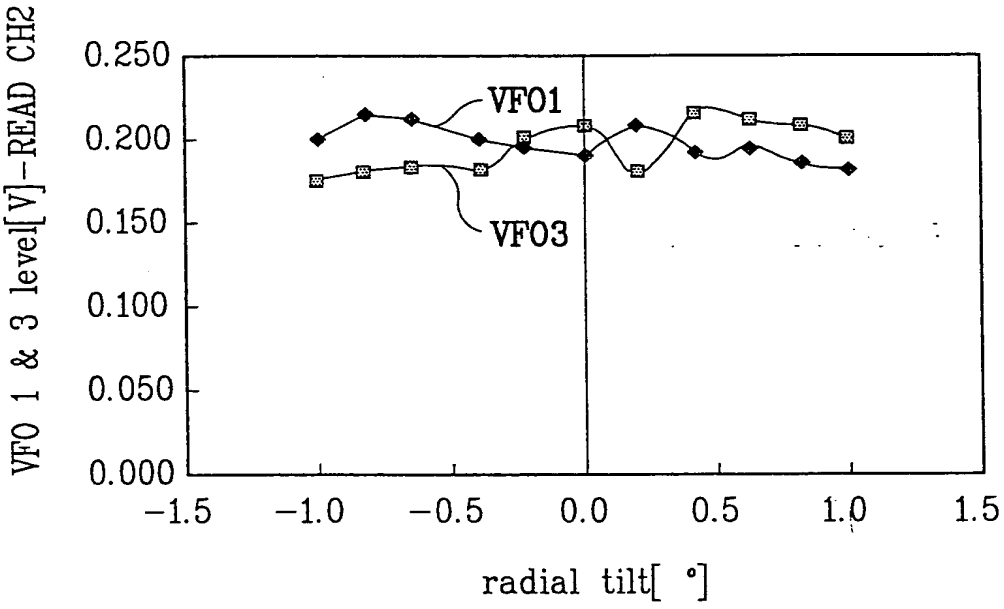
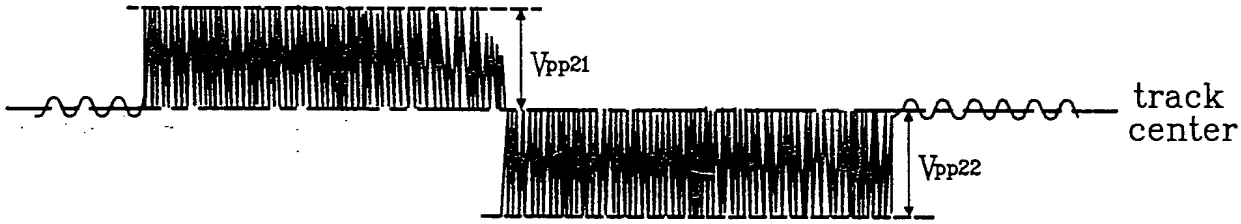

VFO 1 & 3 level[V]-READ CH2
0.250
0.200
0.150
0.100
0.050
0.000
VFO1
VFO3
−1.5
−1.0
−0.5
0.0
0.5
1.0
1.5
radial tilt[°]

FIG.11A

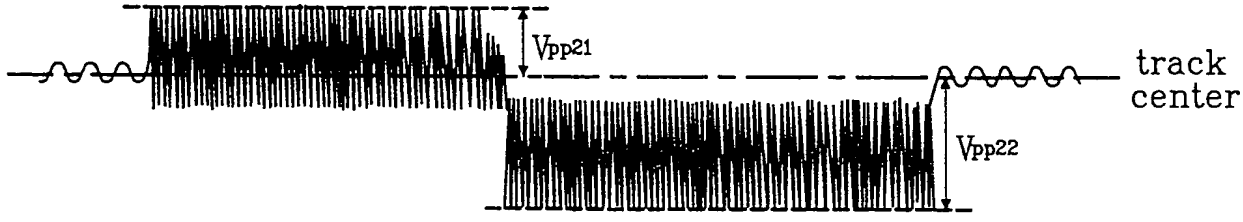
tilt=1, detrack offset=4.97
defocus offset=4.08

FIG.11B



tilt=0, detrack offset=4.97
defocus offset=4.08

FIG.11C



tilt=−1, detrack offset=4.97
defocus offset=4.08

FIG.12

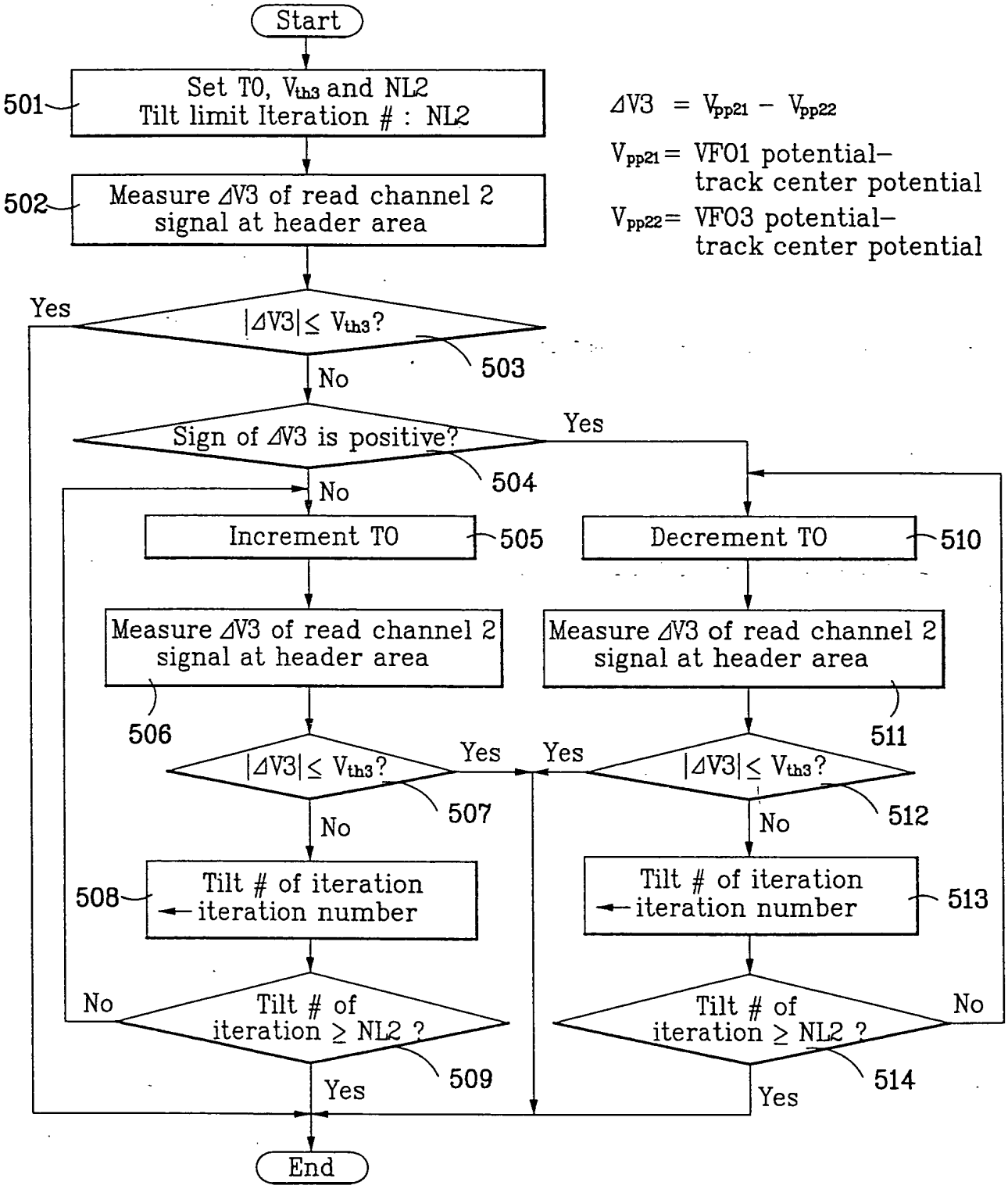
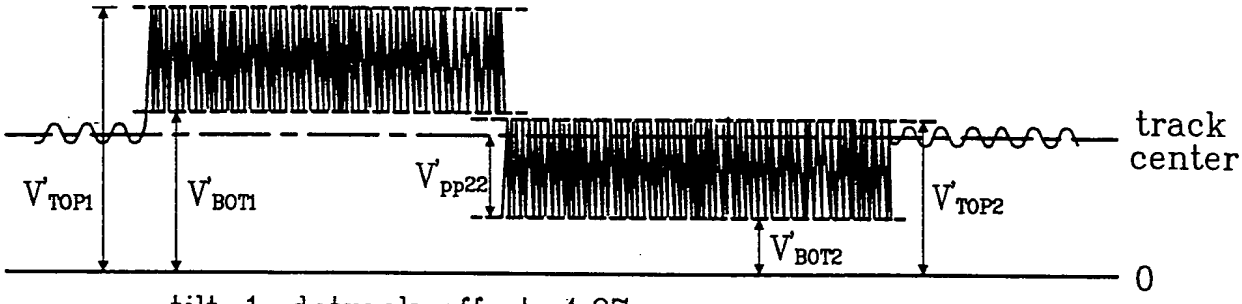
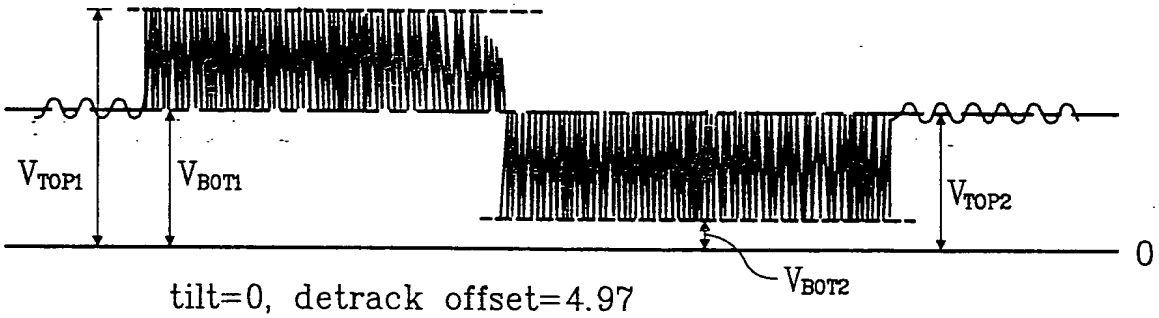

Start
501
Set T0, V_{th3} and NL2
Tilt limit Iteration # : NL2
502
Measure ΔV3 of read channel 2 signal at header area
Yes
$|\Delta V3| \leq V_{th3}$?
503
No
Sign of ΔV3 is positive?
504
Yes
No
Increment T0
505
Decrement T0
510
Measure ΔV3 of read channel 2 signal at header area
506
Measure ΔV3 of read channel 2 signal at header area
511
$|\Delta V3| \leq V_{th3}$?
507
Yes
Yes
$|\Delta V3| \leq V_{th3}$?
512
No
No
508
Tilt # of iteration ← iteration number
Tilt # of iteration ← iteration number
513
No
Tilt # of iteration ≥ NL2 ?
509
Tilt # of iteration ≥ NL2 ?
514
No
Yes
Yes
End
$\Delta V3 = V_{pp21} - V_{pp22}$
V_{pp21}= VF01 potential– track center potential
V_{pp22}= VF03 potential– track center potential

FIG.13A



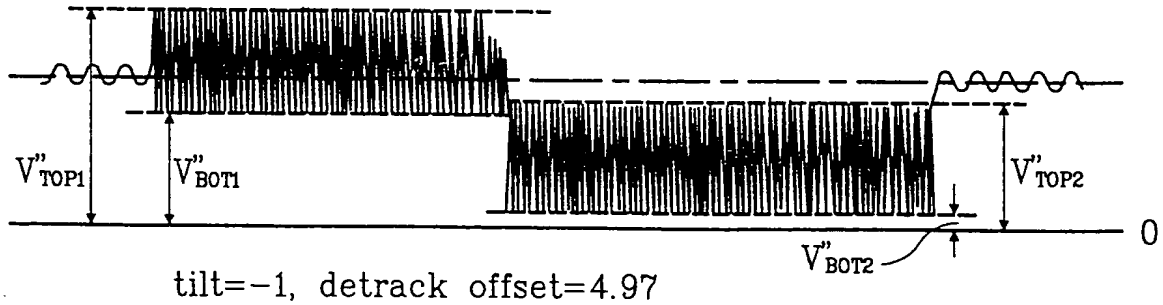
tilt=1, detrack offset=4.97
defocus offset=4.08

FIG.13B



tilt=0, detrack offset=4.97
defocus offset=4.08

FIG.13C



tilt=−1, detrack offset=4.97
defocus offset=4.08

FIG.14

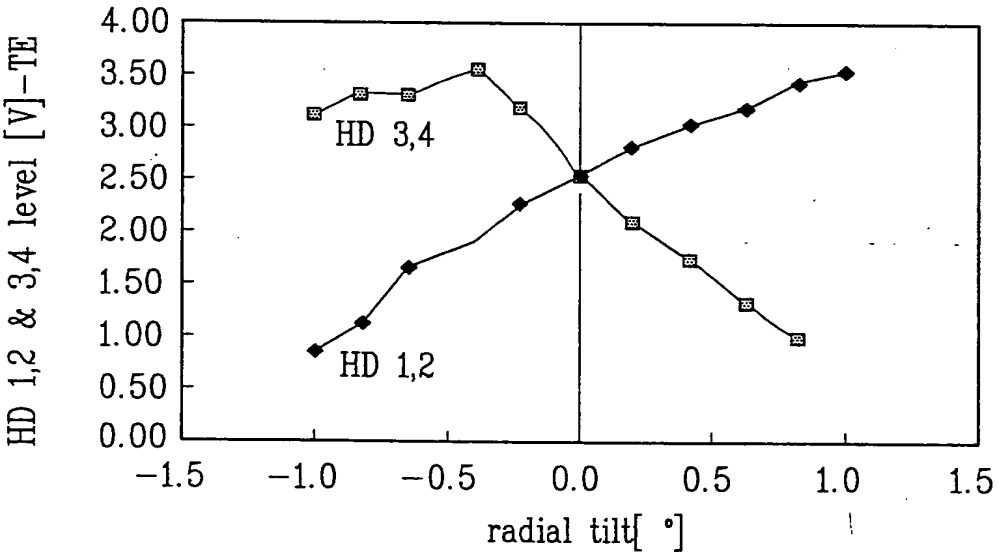
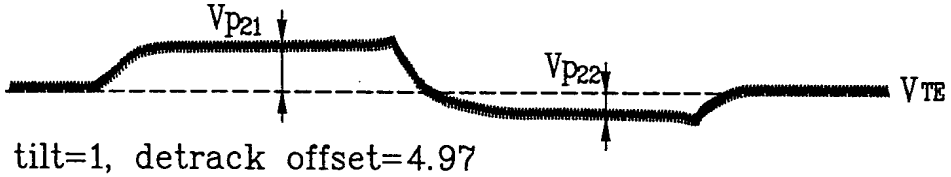
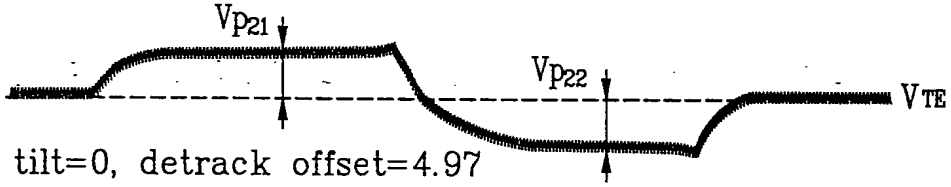

HD 1,2 & 3,4 level [V]-TE
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
−1.5
−1.0
−0.5
0.0
0.5
1.0
1.5
radial tilt[°]
HD 3,4
HD 1,2

FIG.15A



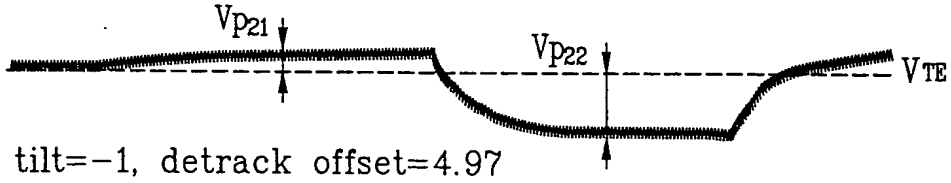
tilt=1, detrack offset=4.97
defocus offset=4.08

FIG.15B



tilt=0, detrack offset=4.97
defocus offset=4.08

FIG.15C



tilt=−1, detrack offset=4.97
defocus offset=4.08

FIG.16

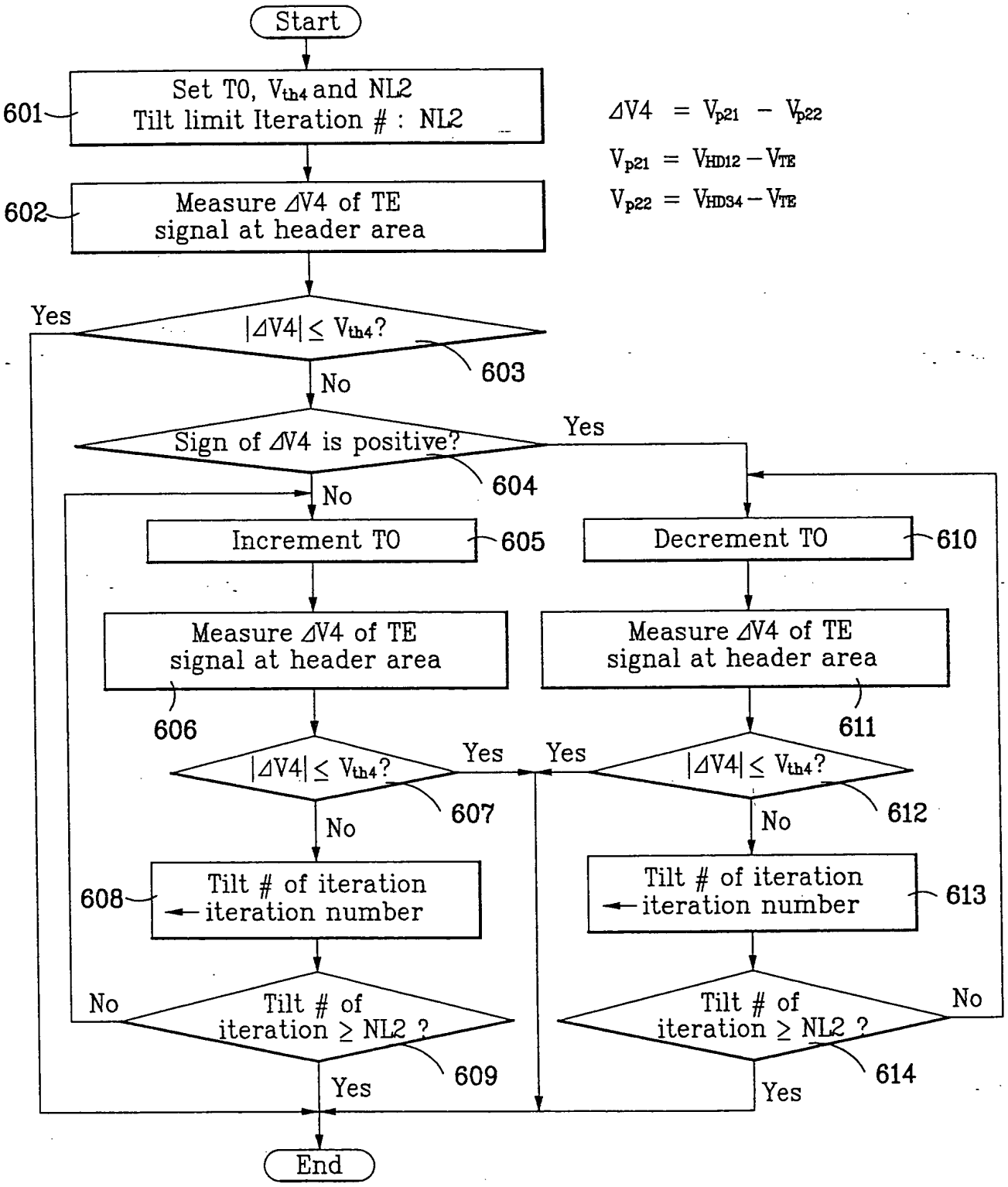

Start
Set T0, V_{th4} and NL2
Tilt limit Iteration # : NL2
601
Measure ΔV4 of TE
signal at header area
602
$|\Delta V4| \leq V_{th4}$?
603
Yes
No
Sign of ΔV4 is positive?
604
Yes
No
Increment T0
605
Decrement T0
610
Measure ΔV4 of TE
signal at header area
606
Measure ΔV4 of TE
signal at header area
611
$|\Delta V4| \leq V_{th4}$?
607
Yes
No
$|\Delta V4| \leq V_{th4}$?
612
Yes
No
Tilt # of iteration
← iteration number
608
Tilt # of iteration
← iteration number
613
Tilt # of
iteration ≥ NL2 ?
609
No
Yes
Tilt # of
iteration ≥ NL2 ?
614
No
Yes
End
$\Delta V4 = V_{p21} - V_{p22}$
$V_{p21} = V_{HD12} - V_{TE}$
$V_{p22} = V_{HD34} - V_{TE}$

FIG.17

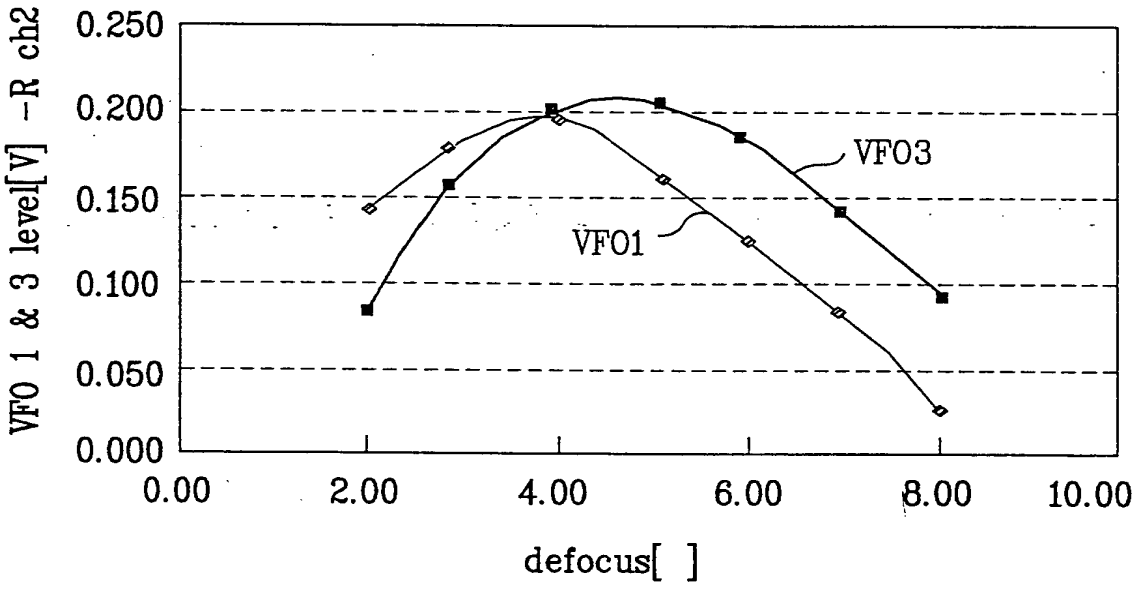
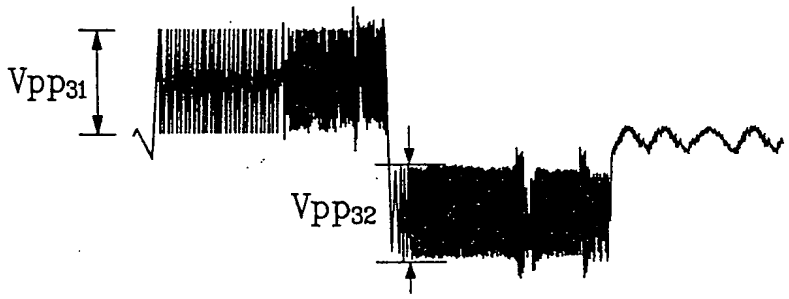
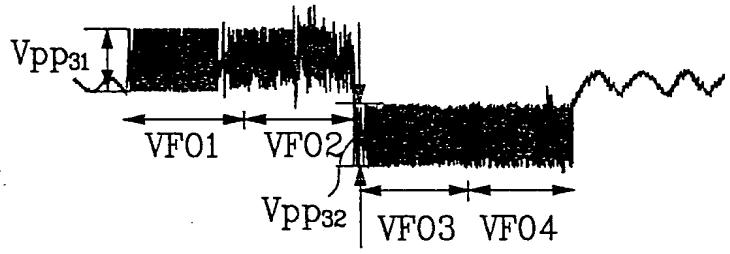

VFO 1 & 3 level[V] -R ch2
0.250
0.200
0.150
0.100
0.050
0.000
0.00
2.00
4.00
6.00
8.00
10.00
defocus[ ]
VFO3
VFO1

FIG.18A



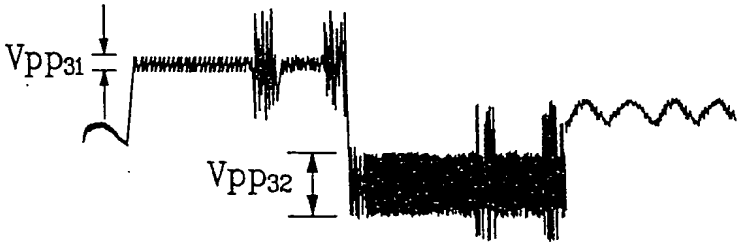
tilt=0,detrack offset=4.97
defocus offset=2.0

FIG.18B



tilt=0,detrack offset=4.97
defocus offset=4.08

FIG.18C



tilt=0,detrack offset=4.97
defocus offset=8.0

FIG.19

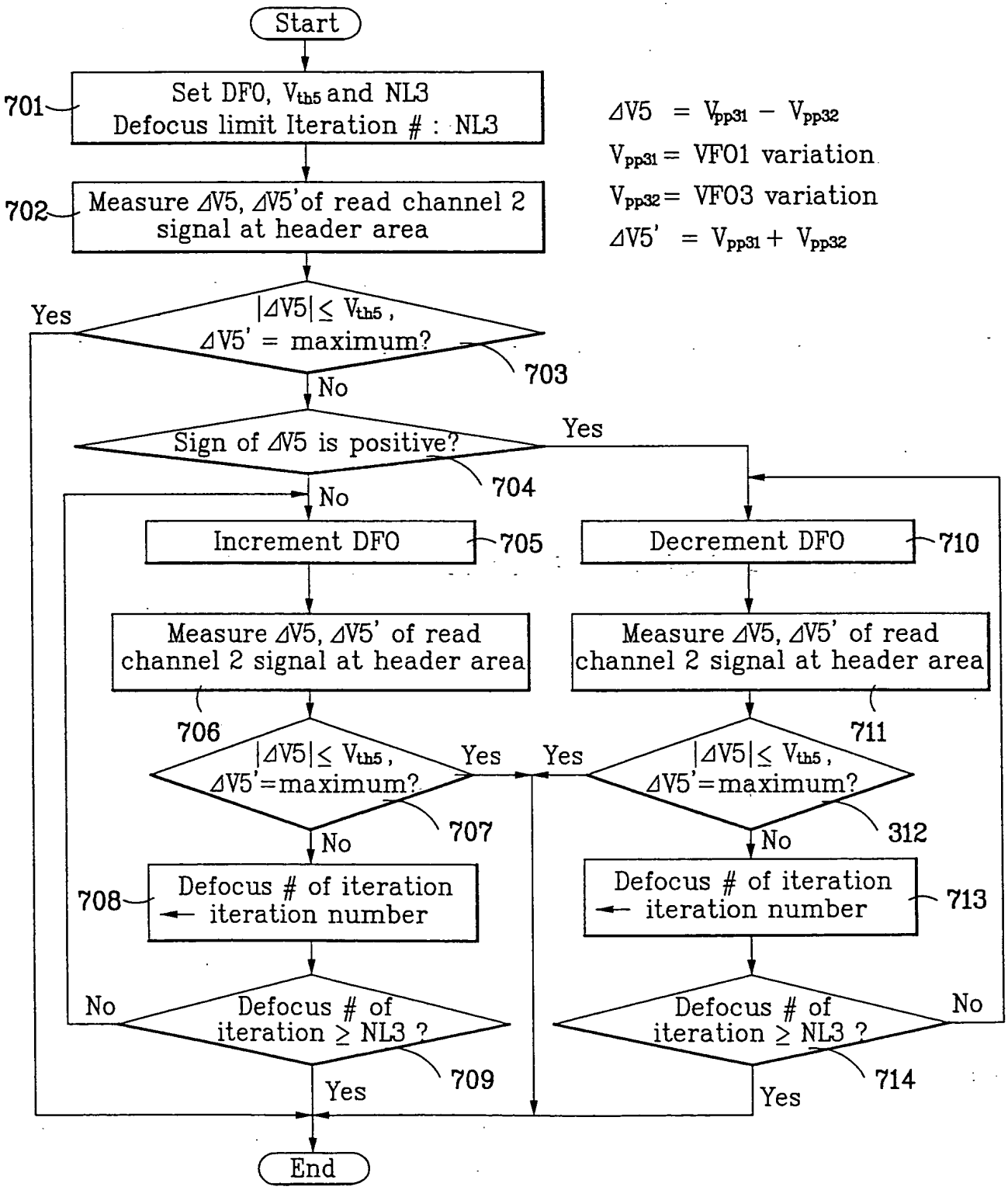

Start
701
Set DF0, V_{th5} and NL3
Defocus limit Iteration # : NL3
702
Measure ⊿V5, ⊿V5'of read channel 2 signal at header area
Yes
$|\Delta V5| \leq V_{th5}$, ⊿V5' = maximum?
703
No
Sign of ⊿V5 is positive?
Yes
704
No
Increment DFO
705
Decrement DFO
710
Measure ⊿V5, ⊿V5' of read channel 2 signal at header area
Measure ⊿V5, ⊿V5' of read channel 2 signal at header area
706
711
$|\Delta V5| \leq V_{th5}$, ⊿V5'=maximum?
Yes
Yes
$|\Delta V5| \leq V_{th5}$, ⊿V5'=maximum?
707
312
No
No
708
Defocus # of iteration ← iteration number
Defocus # of iteration ← iteration number
713
No
Defocus # of iteration ≥ NL3 ?
709
Defocus # of iteration ≥ NL3 ?
No
714
Yes
Yes
End
⊿V5 = V_{pp31} − V_{pp32}
V_{pp31} = VFO1 variation
V_{pp32} = VFO3 variation
⊿V5' = V_{pp31} + V_{pp32}

FIG.20

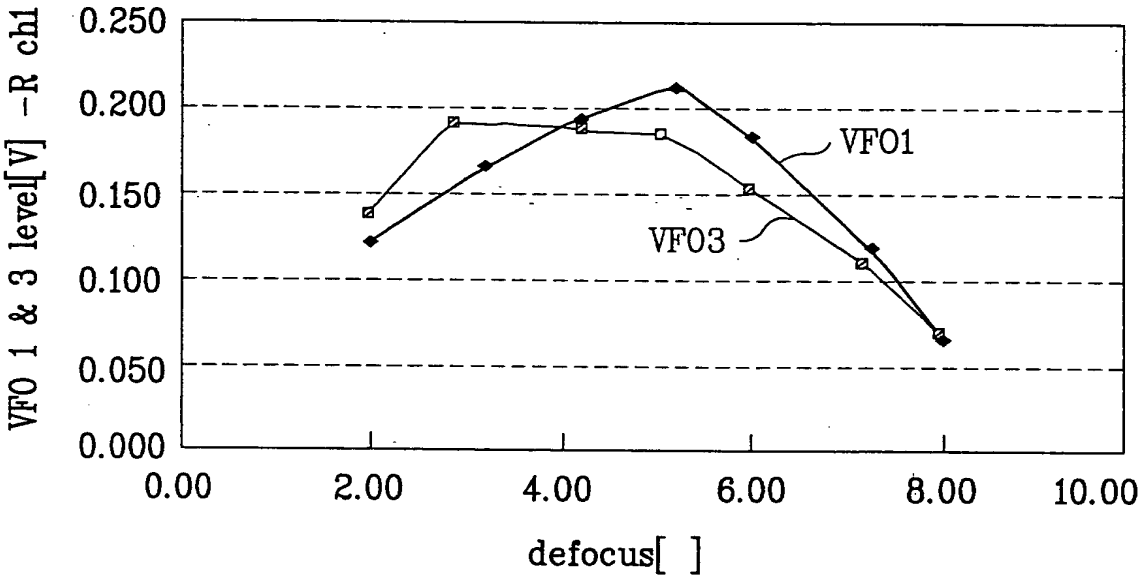
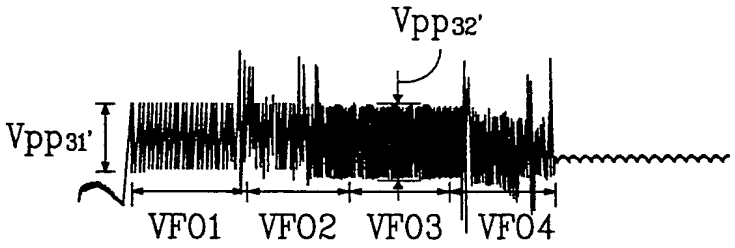

VFO 1 & 3 level[V] -R ch1
0.250
0.200
0.150
0.100
0.050
0.000
0.00
2.00
4.00
6.00
8.00
10.00
defocus[ ]
VFO1
VFO3

FIG.21A



tilt=0,detrack offset=4.97
defocus offset=2.0

FIG.21B

tilt=0,detrack offset=4.97
defocus offset=4.08

FIG.21C

tilt=0,detrack offset=4.97
defocus offset=8.0

FIG.22A

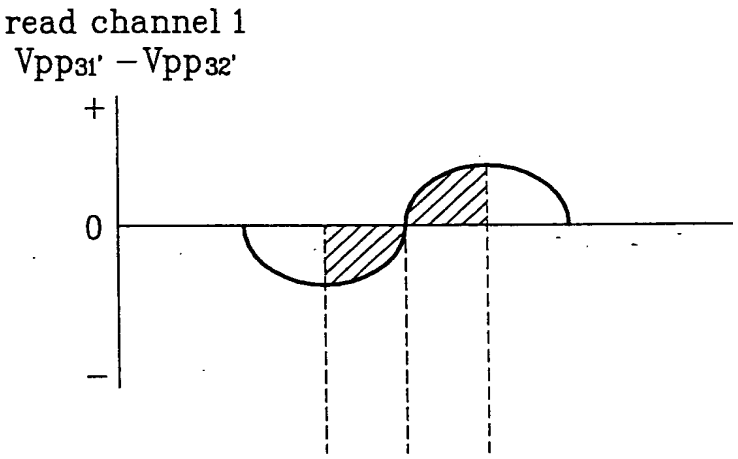


FIG.22B

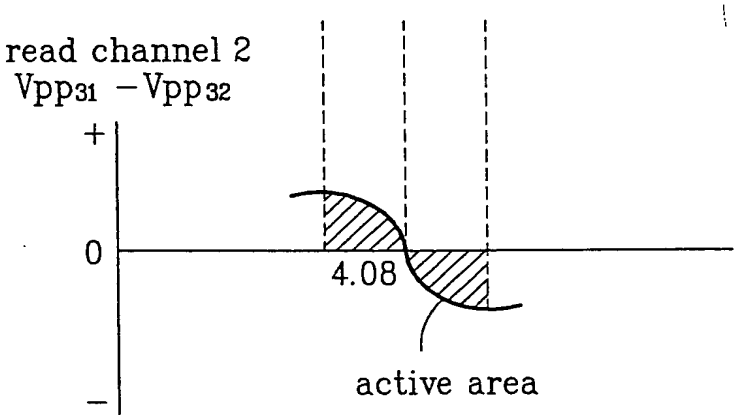


FIG.23

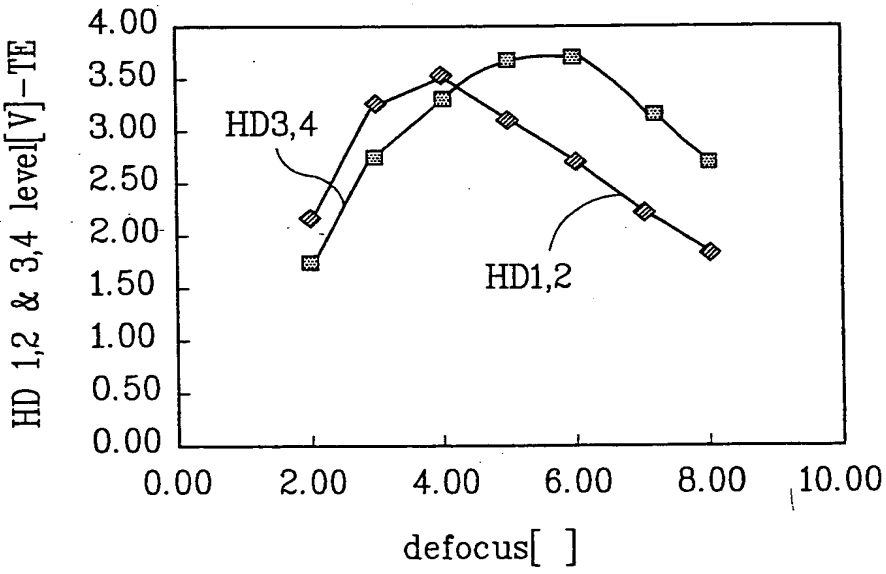
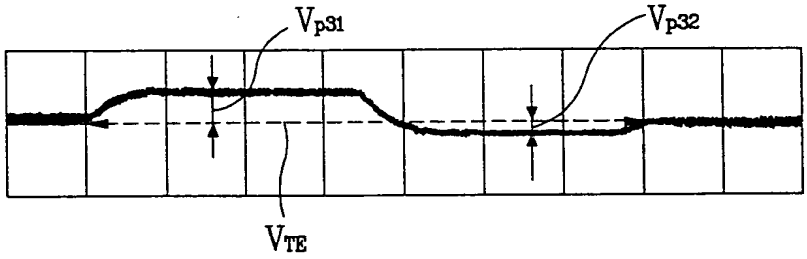
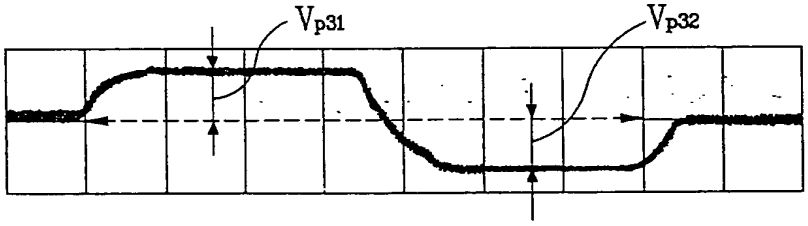

HD 1,2 & 3,4 level[V]-TE
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0.00
2.00
4.00
6.00
8.00
10.00
defocus[ ]
HD3,4
HD1,2

FIG.24A



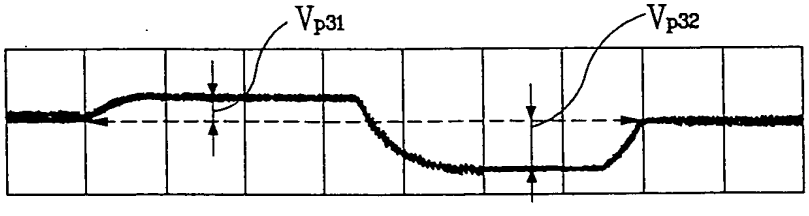
tilt=0, detrack offset=4.97
defocus offset=2.0

FIG.24B



tilt=0, detrack offset=4.97
defocus offset=4.8

FIG.24C



tilt=0, detrack offset=4.97
defocus offset=8.0

FIG.25

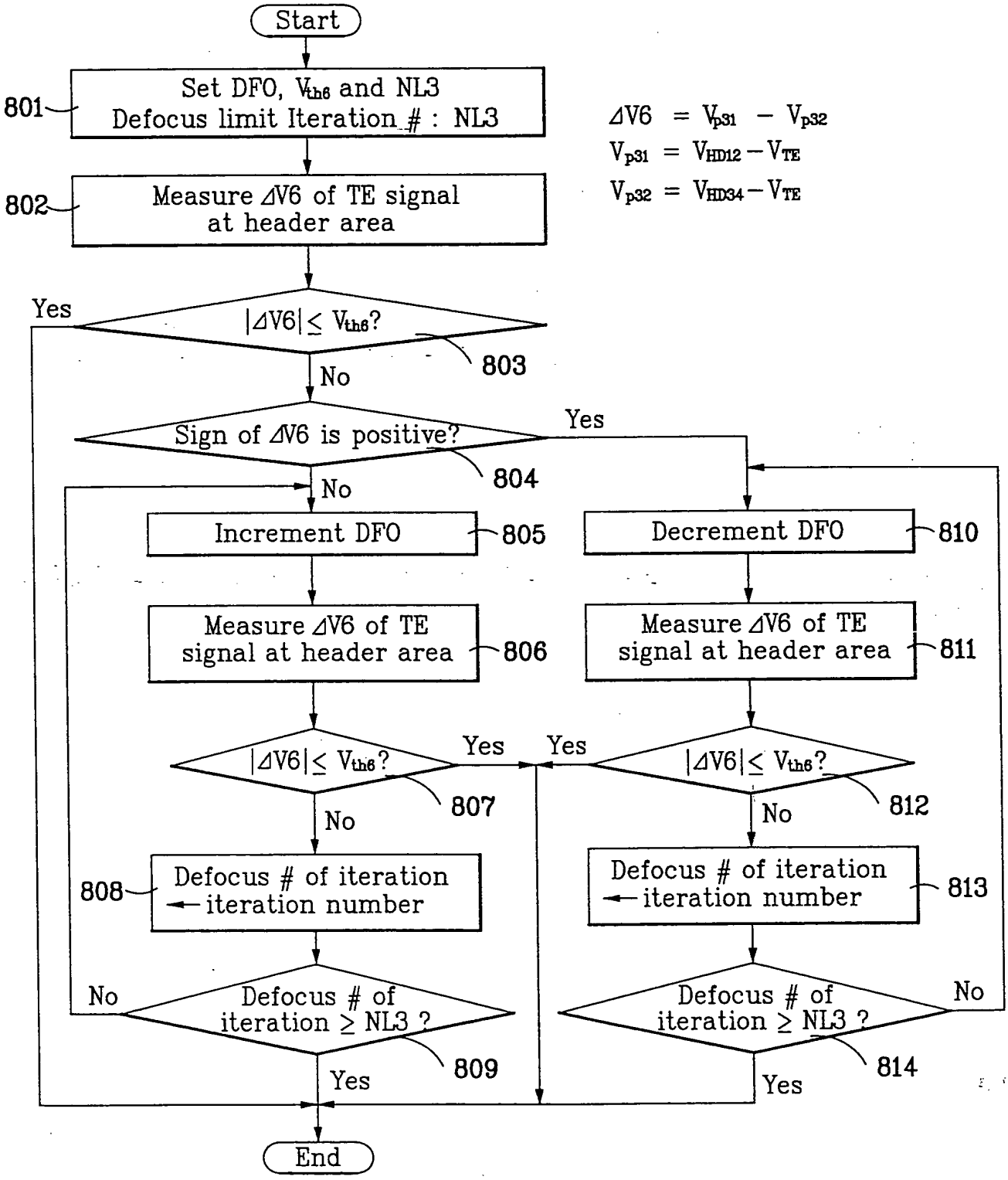
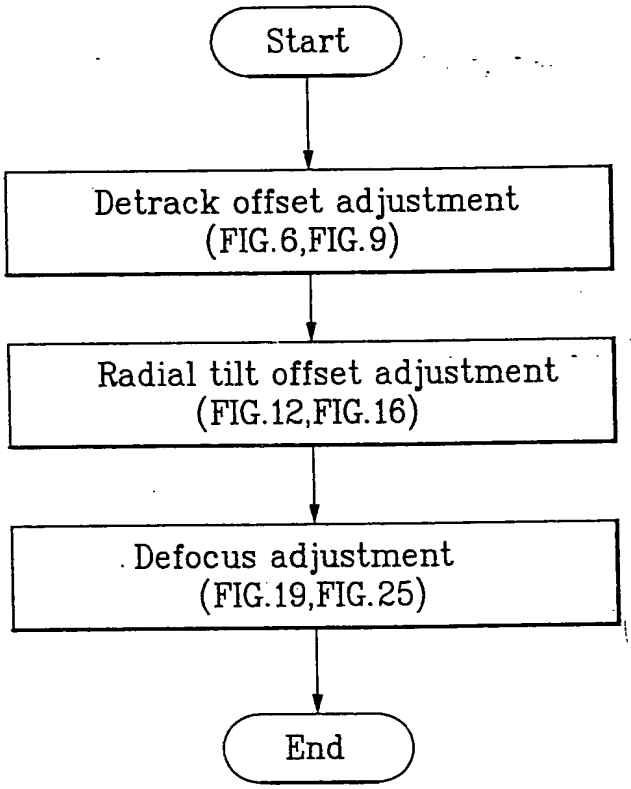

Start
Set DFO, V_{th6} and NL3
Defocus limit Iteration # : NL3
801
Measure ⊿V6 of TE signal
at header area
802
$|\Delta V6| \leq V_{th6}$?
803
Yes
No
Sign of ⊿V6 is positive?
804
Yes
No
Increment DFO
805
Measure ⊿V6 of TE
signal at header area
806
$|\Delta V6| \leq V_{th6}$?
807
Yes
No
Defocus # of iteration
← iteration number
808
Defocus # of
iteration ≥ NL3 ?
809
No
Yes
Decrement DFO
810
Measure ⊿V6 of TE
signal at header area
811
$|\Delta V6| \leq V_{th6}$?
812
Yes
No
Defocus # of iteration
← iteration number
813
Defocus # of
iteration ≥ NL3 ?
814
No
Yes
End
$\Delta V6 = V_{p31} - V_{p32}$
$V_{p31} = V_{HD12} - V_{TE}$
$V_{p32} = V_{HD34} - V_{TE}$

FIG.26


Start
Detrack offset adjustment
(FIG.6,FIG.9)
Radial tilt offset adjustment
(FIG.12,FIG.16)
Defocus adjustment
(FIG.19,FIG.25)
End